

What is claimed is:

1 1. A control thin film transistor for controlling
2 an organic light-emitting diode (OLED), comprising:
3 a substrate;
4 a semiconductor layer disposed on the substrate as a
5 channel region;
6 a first and second doped region sequentially
7 disposed on a first side of the semiconductor
8 layer, wherein the doped concentration of the
9 first doped region is lower than that of the
10 second doped region, and the first doped region
11 serves as a single-side lightly doped drain
12 region and the second doped region serves as a
13 drain region;
14 a third doped region disposed on a second side of
15 the semiconductor layer, which is opposite to
16 the first side, serving as a source region;
17 an insulating layer disposed on the surface of the
18 semiconductor layer, and the first, second, and
19 third regions;
20 a source and drain electrode penetrating the
21 insulating layer contacting the source and
22 drain regions respectively, wherein the drain
23 electrode receives a drain voltage and the
24 source electrode is electrically connected to
25 an OLED unit; and
26 a conductive layer serving as a gate layer disposed
27 in the insulating layer, at approximately the
28 top right portion of the semiconductor layer.

1 2. The control thin film transistor as claimed in
2 claim 1, wherein the semiconductor layer is composed of
3 polysilicon.

1 3. The control thin film transistor as claimed in
2 claim 1, wherein the first, second and third doped
3 regions are n-type doped.

1 4. The control thin film transistor as claimed in
2 claim 1, wherein the first, second and third doped
3 regions are p-type doped.

1 5. The control thin film transistor as claimed in
2 claim 1, wherein the first, second and third doped
3 regions are mainly composed of silicon.

1 6. A control thin film transistor for controlling
2 an organic light-emitting diode (OLED), comprising:

3 a substrate;

4 a semiconductor layer disposed on the substrate as a
5 channel region;

6 a first and second doped region sequentially
7 disposed on a first side of the semiconductor
8 layer, wherein the doped concentration of the
9 first doped region is lower than that of the
10 second doped region, and the second doped
11 region serves as a drain region;

12 a third and fourth doped region sequentially
13 disposed on a second side of the semiconductor
14 layer, which is opposite to the first side;
15 wherein the doped concentration of the third

16 doped region is lower than that of the fourth
17 doped region that serves as a source region and
18 the length of the third doped region is less
19 than that of the first doped region;
20 an insulating layer disposed on the surface of the
21 semiconductor layer, and the first, second,
22 third and fourth regions;
23 a source and drain electrode penetrating the
24 insulating layer contacting the source and
25 drain regions respectively, wherein the drain
26 electrode receives a drain voltage and the
27 source electrode is electrically connected to
28 an OLED unit; and
29 a conductive layer serving as a gate layer disposed
30 in the insulating layer, at approximately the
31 top right portion of the semiconductor layer.

1 7. The control thin film transistor as claimed in
2 claim 6, wherein the semiconductor layer is composed of
3 polysilicon.

1 8. The control thin film transistor as claimed in
2 claim 6, wherein the first, second, third and fourth
3 doped regions are n-type doped.

1 9. The control thin film transistor as claimed in
2 claim 6, wherein the first, second, third and fourth
3 doped regions are p-type doped.

1 10. The control thin film transistor as claimed in
2 claim 6, wherein the first, second, third and fourth
3 doped regions are mainly composed of silicon.

1 11. An electroluminescent display device, which
2 sequentially scans a plurality of pixels composing a
3 display screen and provides current to the scanned pixels
4 according to pixel signals received while scanning,
5 thereby activating electroluminescent units in the pixels
6 to display figures on the display screen according to the
7 pixel signals, the device is characterized by having a
8 plurality of control TFTs as claimed in claim 1 in the
9 pixels to control the current provided to the scanned
10 pixels.

1 12. An electroluminescent display device, which
2 sequentially scans a plurality of pixels composing a
3 display screen and provides current to the scanned pixels
4 according to pixel signals received while scanning,
5 thereby activating electroluminescent units in the pixels
6 to display figures on the display screen according to the
7 pixel signals, the device is characterized by having
8 plurality of control TFTs as claimed in claim 5 in the
9 pixels to control the current provided to the scanned
10 pixels.

1 13. A method of fabricating a control thin film
2 transistor for controlling a current of an OLED unit,
3 comprising the steps of:

4 providing a substrate;

5 forming and defining a semiconductor layer on the
6 substrate;

7 forming a first photoresist layer covering a portion
8 of the semiconductor layer, exposing

predetermined portions on the semiconductor layer for a source and drain regions; performing a first ion implantation of the semiconductor layer using the first photoresist layer as a mask to form the source and drain regions thereon; removal of the first photoresist layer; forming a first insulating layer covering the surface of the substrate and the semiconductor layer; forming a second photoresist layer on the first insulating layer, which covers the un-implanted area of the semiconductor layer but exposes only a portion of the un-implanted area of the semiconductor layer adjacent to the drain region; performing a second ion implantation of the semiconductor layer using the second photoresist layer as a mask to form a lightly doped region with a doped concentration lower than that of the adjacent drain region; removal of the second photoresist layer; forming a gate layer on the first insulating layer and at approximately the right top of the undoped semiconductor layer; forming a second insulating layer covering the surface of the first insulating layer and the gate layer; and forming a source and drain electrodes penetrating the first and second insulating layer in

39 contact with the source and drain regions
40 respectively, wherein the drain electrode
41 receives a drain voltage and the source
42 electrode is electrically connected to an OLED
43 unit.

1 14. The method as claimed in claim 13, wherein
2 forming the semiconductor layer further comprises the
3 steps of:

4 forming an amorphous silicon layer on the substrate;
5 and
6 performing a laser treatment of the amorphous
7 silicon layer to crystallize as a polysilicon
8 layer as the semiconductor layer.

1 15. The method as claimed in claim 14, wherein
2 dopants of the first and second ion implantation are n-
3 type dopants.

1 16. The method as claimed in claim 14, wherein
2 dopants of the first and second ion implantation are p-
3 type dopants.

1 17. The method as claimed in claim 14, wherein the
2 first and second insulating layers are silicon oxide.

1 18. A method of fabricating a control thin film
2 transistor for controlling a current of an OLED unit,
3 comprising the steps of:

4 providing a substrate;
5 forming and defining a semiconductor layer on the
6 substrate;

7 forming a first photoresist layer covering a portion
8 of the semiconductor layer, exposing
9 predetermined portions on the semiconductor
10 layer for a source and drain region;
11 performing a first ion implantation of the
12 semiconductor layer using the first photoresist
13 layer as a mask to form the source and drain
14 regions thereon;
15 removal of the first photoresist layer;
16 forming a first insulating layer covering the
17 surface of the substrate and the semiconductor
18 layer;
19 forming a second photoresist layer on the first
20 insulating layer, which covers the un-implanted
21 area of the semiconductor layer but exposes two
22 portions of the un-implanted area of the
23 semiconductor layer adjacent to the drain and
24 source regions respectively, wherein the
25 portion adjacent to the drain region is greater
26 than the portion adjacent to the source region;
27 performing a second ion implantation of the
28 semiconductor layer using the second
29 photoresist layer as a mask to form lightly
30 doped drain and source regions with a dopant
31 concentration lower than that of the adjacent
32 drain and source regions respectively, wherein
33 the lightly doped drain region is larger than
34 the lightly doped source region;
35 removal of the second photoresist layer;

36 forming a gate layer on the first insulating layer
37 and at approximately the right top of the un-
38 doped semiconductor layer;
39 forming a second insulating layer covering the
40 surface of the first insulating layer and the
41 gate layer; and
42 forming a source and drain electrodes penetrating
43 the first and second insulating layer in
44 contact with the source and drain regions
45 respectively, wherein the drain electrode
46 receives a drain voltage and the source
47 electrode is electrically connected to an OLED
48 unit.

1 19. The method as claimed in claim 18, wherein
2 forming the semiconductor layer further comprises the
3 steps of:

4 forming an amorphous silicon layer on the substrate;
5 and
6 performing a laser treatment of the amorphous
7 silicon layer to crystallize as a polysilicon
8 layer as the semiconductor layer.

1 20. The method as claimed in claim 19, wherein
2 dopants of the first and second ion implantation are n-
3 type dopants.

1 21. The method as claimed in claim 19, wherein
2 dopants of the first and second ion implantation are p-
3 type dopants.

1 22. The method as claimed in claim 19, wherein the
2 first and second insulating layers are silicon oxide.